

WHAT IS CLAIMED IS

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1. An information recording method for recording a sequence of sync frames, indicative of data, onto tracks of an optical recording medium in which prepits are formed on lands between the tracks at given intervals, and in which sync patterns, providing
10 synchronization on a sync-frame basis, are inserted in the sync frames such that each sync pattern has a length in a track direction larger than a length of one of the prepits and a position of each sync pattern matches with a position of at least one of the prepits, the information recording method comprising the steps of:

15 selecting codes that represent sync patterns for the sync frames such that each sync pattern is formed as a space on the recording medium;

generating modulation codes based on the sync frames in which the selected codes are inserted, by modulating the sync frames
20 containing the selected codes in accordance with a predetermined modulation scheme;

generating a sequence of recording pulses by converting the modulation codes through a predetermined conversion scheme; and

detecting a prepit position signal from one of the prepits for
25 each of the sync frames during the writing of the recording pulses to

the recording medium, so that a write position control is performed based the detected prepit position signal.

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2. An information recording method for recording a sequence of sync frames, indicative of data, onto tracks of an optical recording medium in which prepits are formed on lands between the tracks at given intervals, and in which sync patterns, providing
10 synchronization on a sync-frame basis, are inserted in the sync frames such that each sync pattern has a length in a track direction larger than a length of one of the prepits and a position of each sync pattern matches with a position of at least one of the prepits, the
15 information recording method comprising the steps of:

selecting codes that represent first sync patterns for a portion of the sync frames such that each first sync pattern is formed as a space on the recording medium, and selecting codes that represent second sync patterns for the remainder of the sync frames such that
20 each second sync pattern is formed on the recording medium so as to meet a low-frequency reduction scheme;

generating modulation codes based on the sync frames in which the selected codes are inserted, by modulating the sync frames containing the selected codes in accordance with a predetermined
25 modulation scheme;

generating a sequence of recording pulses by converting the modulation codes through a predetermined conversion scheme; and

5 detecting a prepit position signal from one of the prepits for each of the sync frames during the writing of the recording pulses to the recording medium, so that a write position control is performed based the detected prepit position signal.

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3. An information recording method for recording a sequence of sync frames, indicative of data, onto tracks of an optical recording medium in which prepits are formed on lands between the tracks at given intervals, and in which sync patterns, providing
15 synchronization on a sync-frame basis, are inserted in the sync frames such that each sync pattern has a length in a track direction larger than a length of one of the prepits and a position of each sync pattern matches with a position of at least one of the prepits, the information recording method comprising the steps of:

20 providing the prepits which are formed on the lands of the recording medium at intervals that are equal to an integral multiple of a unit length corresponding to a channel bit;

selecting codes that represent first sync patterns for a portion of the sync frames such that each of the first sync patterns is formed
25 as a space on the recording medium, when positions of the first sync

patterns match with positions of the prepits, and selecting codes that represent second sync patterns for the remainder of the sync frames such that each of the second sync pattern is formed on the recording medium so as to meet a low-frequency reduction scheme, when
5 positions of the second sync patterns do not match with the positions of the prepits;

generating modulation codes based on the sync frames in which the selected codes are inserted, by modulating the sync frames containing the selected codes in accordance with a predetermined
10 modulation scheme;

generating a sequence of recording pulses by converting the modulation codes through a predetermined conversion scheme; and

detecting a prepit position signal from one of the prepits for each of the sync frames during the writing of the recording pulses to
15 the recording medium, so that a write position control is performed based the detected prepit position signal.

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4. An information recording method for recording a sequence of sync frames, indicative of data, onto tracks of an optical recording medium in which prepits are formed on lands between the tracks at given intervals, and in which sync patterns, providing
25 synchronization on a sync-frame basis, are inserted in the sync

frames such that each sync pattern has a length in a track direction larger than a length of one of the prepits and a position of each sync pattern matches with a position of at least one of the prepits, the information recording method comprising the steps of:

- 5 selecting codes that represent first sync patterns for a portion of the sync frames such that each of the first sync patterns is formed as a space, when the number of the first sync patterns being successively formed as a mark, positions of the first sync patterns matching with positions of the prepits, is larger than a
- 10 predetermined number, and otherwise selecting codes that represent second sync patterns for the remainder of the sync frames such that each of the second sync pattern is formed so as to meet a low-frequency reduction scheme;
- generating modulation codes based on the sync frames in
- 15 which the selected codes are inserted, by modulating the sync frames containing the selected codes in accordance with a predetermined modulation scheme;
- generating a sequence of recording pulses by converting the modulation codes through a predetermined conversion scheme; and
- 20 detecting a prepit position signal from one of the prepits for each of the sync frames during the writing of the recording pulses to the recording medium, so that a write position control is performed based the detected prepit position signal.

5. The information recording method of claim 2, wherein in said selecting step, when a difference between absolute values of digital sum of the selected codes for the second sync patterns is equal to zero or less than a predetermined value, the second sync pattern codes are selected such that each second sync pattern is formed as a space on the recording medium.

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6. An information recording apparatus for recording a sequence of sync frames, indicative of data, onto tracks of an optical recording medium in which prepits are formed on lands between the tracks at given intervals, and in which sync patterns, providing synchronization on a sync-frame basis, are inserted in the sync frames such that each sync pattern has a length in a track direction larger than a length of one of the prepits and a position of each sync pattern matches with a position of at least one of the prepits, the information recording apparatus comprising:

20 sync information generating means for selecting codes that represent sync patterns for the sync frames such that each sync pattern is formed as a space on the recording medium;

 prepit position signal detecting means for detecting a prepit position signal from one of the prepits for each of the sync frames during the writing of the recording pulses to the recording medium;

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write position signal generating means for generating a write-position start signal based on the prepit position signal detected by the prepit position signal detecting means; and

5 data encoding means for generating modulation codes based on the sync frames in which the codes selected by the sync information generating means are inserted, by modulating the sync frames containing the selected codes in accordance with a predetermined modulation scheme, the data encoding means generating a sequence of recording pulses by converting the modulation codes through a
10 predetermined conversion scheme, and the data encoding means starting outputting the sequence of recording pulses in accordance with the write-position start signal supplied by the write position signal generating means.

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7. An information recording apparatus for recording a sequence of sync frames, indicative of data, onto tracks of an optical
20 recording medium in which prepits are formed on lands between the tracks at given intervals, and in which sync patterns, providing synchronization on a sync-frame basis, are inserted in the sync frames such that each sync pattern has a length in a track direction larger than a length of one of the prepits and a position of each sync
25 pattern matches with a position of at least one of the prepits, the

information recording apparatus comprising:

sync information generating means for selecting codes that represent first sync patterns for a portion of the sync frames such that each first sync pattern is formed as a space on the recording medium, and selecting codes that represent second sync patterns for the remainder of the sync frames such that each second sync pattern is formed on the recording medium so as to meet a low-frequency reduction scheme;

prepit position signal detecting means for detecting a prepit position signal from one of the prepits for each of the sync frames during the writing of the recording pulses to the recording medium;

write position signal generating means for generating a write-position start signal based on the prepit position signal detected by the prepit position signal detecting means; and

data encoding means for generating modulation codes based on the sync frames in which the codes selected by the sync information generating means are inserted, by modulating the sync frames containing the selected codes in accordance with a predetermined modulation scheme, the data encoding means generating a sequence of recording pulses by converting the modulation codes through a predetermined conversion scheme, and the data encoding means starting outputting the sequence of recording pulses in accordance with the write-position start signal supplied by the write position signal generating means.

8. An information recording apparatus for recording a sequence of sync frames, indicative of data, onto tracks of an optical recording medium in which prepits are formed on lands between the tracks at intervals that are equal to an integral multiple of a unit
5 length corresponding to a channel bit, and in which sync patterns, providing synchronization on a sync-frame basis, are inserted in the sync frames such that each sync pattern has a length in a track direction larger than a length of one of the prepits and a position of each sync pattern matches with a position of at least one of the
10 prepits, the information recording apparatus comprising:

sync information generating means for selecting codes that represent first sync patterns for a portion of the sync frames such that each of the first sync patterns is formed as a space on the recording medium, when positions of the first sync patterns match
15 with positions of the prepits, and for selecting codes that represent second sync patterns for the remainder of the sync frames such that each of the second sync pattern is formed on the recording medium so as to meet a low-frequency reduction scheme, when positions of the second sync patterns do not match with the positions of the
20 prepits;

prepit position signal detecting means for detecting a prepit position signal from one of the prepits for each of the sync frames during the writing of the recording pulses to the recording medium;

write position signal generating means for generating a write-
25 position start signal based on the prepit position signal detected by

the prepit position signal detecting means; and

data encoding means for generating modulation codes based on the sync frames in which the codes selected by the sync information generating means are inserted, by modulating the sync frames
5 containing the selected codes in accordance with a predetermined modulation scheme, the data encoding means generating a sequence of recording pulses by converting the modulation codes through a predetermined conversion scheme, and the data encoding means starting outputting the sequence of recording pulses in accordance
10 with the write-position start signal supplied by the write position signal generating means.

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9. An information recording apparatus for recording a sequence of sync frames, indicative of data, onto tracks of an optical recording medium in which prepits are formed on lands between the tracks at given intervals, and in which sync patterns, providing
20 synchronization on a sync-frame basis, are inserted in the sync frames such that each sync pattern has a length in a track direction larger than a length of one of the prepits and a position of each sync pattern matches with a position of at least one of the prepits, the information recording apparatus comprising:

25 sync information generating means for selecting codes that

represent first sync patterns for a portion of the sync frames such that each of the first sync patterns is formed as a space, when the number of the first sync patterns being successively formed as a mark, positions of the first sync patterns matching with positions of the prepits, is larger than a predetermined number, and otherwise for selecting codes that represent second sync patterns for the remainder of the sync frames such that each of the second sync pattern is formed so as to meet a low-frequency reduction scheme;

prepit position signal detecting means for detecting a prepit position signal from one of the prepits for each of the sync frames during the writing of the recording pulses to the recording medium;

write position signal generating means for generating a write-position start signal based on the prepit position signal detected by the prepit position signal detecting means; and

data encoding means for generating modulation codes based on the sync frames in which the codes selected by the sync information generating means are inserted, by modulating the sync frames containing the selected codes in accordance with a predetermined modulation scheme, the data encoding means generating a sequence of recording pulses by converting the modulation codes through a predetermined conversion scheme, and the data encoding means starting outputting the sequence of recording pulses in accordance with the write-position start signal supplied by the write position signal generating means.

10. The information recording apparatus of claim 6, wherein the prepit position signal detecting means detects a prepit position signal from a sync prepit of the prepits for one of the sync frames during the writing of the recording pulses to the recording medium, and the write position signal generating means generates a write-
5 position start signal based on the detected prepit position signal, such that the sync pattern on the track adjacent to the land where the sync prepit is formed, the position of the sync pattern matching with the position of the sync prepit, is formed as a space on the recording
10 medium.

11. The information recording apparatus of claim 6, wherein the write position signal generating means includes means for generating a frame sync signal, a phase of which is locked to a phase of the prepit position signal supplied by the prepit position signal detecting means, and the write position signal generating means
15 outputs the write-position start signal in accordance with the frame sync signal.

12. The information recording apparatus of claim 9, wherein the prepit position signal detecting means detects a prepit position signal from a sync prepit of the prepits for one of the sync frames during the writing of the recording pulses to the recording medium, and the write position signal generating means generates a write-position start signal based on the detected prepit position signal, such that the sync pattern on the track adjacent to the land where the sync prepit is formed, the position of the sync pattern matching with the position of the sync prepit, is formed as a space on the recording medium.

13. The information recording apparatus of claim 7, wherein the sync information generating means includes means for selecting, when a difference between absolute values of digital sum of the selected codes for the second sync patterns is equal to zero or less than a predetermined value, the second sync pattern codes such that each second sync pattern is formed as a space on the recording medium.

14. An information recording apparatus for recording a sequence of sync frames, indicative of data, onto tracks of an optical recording medium in which prepits are formed on lands between the tracks at given intervals, and in which sync patterns, providing
5 synchronization on a sync-frame basis, are inserted in the sync frames such that each sync pattern has a length in a track direction larger than a length of one of the prepits and a position of each sync pattern matches with a position of at least one of the prepits, the information recording apparatus comprising:

10 first sync information generating means for generating first codes that represent first sync patterns for a portion of the sync frames such that each first sync pattern is formed as a space on the recording medium;

second sync information generating means for generating
15 second codes that represent second sync patterns for the remainder of the sync frames such that each second sync pattern is formed on the recording medium so as to meet a low-frequency reduction scheme;

sync information selecting means for selecting one of the first
20 codes generated by the first sync information generating means and the second codes generated by the second sync information generating means;

prepit position signal detecting means for detecting a prepit
position signal from one of the prepits for each of the sync frames
25 during the writing of the recording pulses to the recording medium;

write position signal generating means for generating a write-position start signal based on the prepit position signal detected by the prepit position signal detecting means; and

5 data encoding means for generating modulation codes based on the sync frames in which the codes selected by the sync information selecting means are inserted, by modulating the sync frames containing the selected codes in accordance with a predetermined modulation scheme, the data encoding means generating a sequence of recording pulses by converting the modulation codes through a
10 predetermined conversion scheme, and the data encoding means starting outputting the sequence of recording pulses in accordance with the write-position start signal supplied by the write position signal generating means.

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15. The information recording apparatus according to claim 14, wherein the prepit position signal detecting means detects a
20 prepit position signal from a sync prepit of the prepits for one of the sync frames, and the write position signal generating means generates a write-position start signal based on the detected prepit position signal, and the sync information selecting means is configured to select the first codes when a position of one of the
25 sync patterns on the track adjacent to the land where the sync prepit

is formed, matches with a position of the sync prepit, and otherwise to select the second codes.

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16. An optical recording medium for use in an information recording apparatus which records a sequence of sync frames, indicative of data, onto tracks of the recording medium, comprising:

10 prepits provided on lands between the tracks at given intervals, the prepits being indicative of address information; and

 sync patterns provided in at least a portion of the sequence of sync frames, the sync patterns providing synchronization on a sync-frame basis, such that each sync pattern has a length in a track

15 direction larger than a length of one of the prepits and a position of each sync pattern matches with a position of at least one of the prepits.

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17. The optical recording medium according to claim 16, wherein the recording medium includes a sync prepit of the prepits for one of the sync frames, the sync prepit allowing the information

25 recording apparatus to detect a prepit position signal during the

writing of the recording pulses to the recording medium, and the information recording apparatus generates a write-position start signal based on the detected prepit position signal, such that the sync pattern on the track adjacent to the land where the sync prepit
5 is formed, the position of the sync pattern matching with the position of the sync prepit, is formed as a space on the recording medium.